

**Education**

Ph.D. 1993,  
Ecology, Evolution  
and Marine Biology,  
University of  
California, Santa  
Barbara, CA

B.S. 1983, Biology,  
University of  
Michigan, Ann  
Arbor, MI (w. high  
honors & high  
distinction)

**Years of**

**Experience**

25

**Additional Training**

Federal Wetland  
Delineation, Wetland  
Training Institute,  
San Diego, CA.  
August 2007

ArcGIS Desktop I.  
ESRI Redlands,  
October 2008

DIANA ENGLE is a Senior Scientist based in Ventura, CA. At Larry Walker Associates, Dr. Engle assists clients in such areas as water quality assessment and monitoring, contaminant source assessment, watershed balances, fate and transport of nutrients and salts, aquatic chemistry, algal and food web dynamics, nutrient criteria development, and other areas of nexus between water quality regulation and aquatic ecology. Recent projects include facilitation of stakeholder groups, TMDL target evaluation, workplans and special studies related to TMDL development and implementation, continuous monitoring of salts, flows, and groundwater recharge, and compilation and evaluation of long-term regional water quality databases. Through a diverse array of activities, Dr. Engle provides technical and strategic assistance for clients regarding state and federal activities in the San Francisco Bay-Delta. In addition, Dr. Engle has tracked environmental planning, legislation, policy and research for stakeholders through production of newsletters, fact sheets, and white papers.

**RELEVANT EXPERIENCE AT LARRY WALKER ASSOCIATES**

**San Francisco Bay-Delta**

On an ongoing basis, provides diverse technical and regulatory assistance related to hypothesized roles of water quality and food web structure in the Pelagic Organism Decline (POD) in the Sacramento-San Joaquin Delta. Activities include:

***State Board Hearings.*** In March 2010, submitted extensive written testimony and was selected to serve on one of four panels providing oral testimony before the State Water Resources Control Board at the Informational Proceeding to Develop Flow Criteria for the Delta Ecosystem.

***Regional Data Analyses.*** Compiled and maintains a comprehensive regional water quality database for the Bay-Delta, which has been used to screen three decades of ambient ammonia data using current and proposed USEPA acute and chronic criteria, and to evaluate relationships among ammonia concentrations, estuarine flows and water exports, and phytoplankton and fish abundance.

***Meetings with State and Federal Officials and NGOs.*** Authors materials (fact sheets, slide shows, white papers, etc.) for client meetings with state and federal elected officials and lobbyists, staff of environmental and regulatory agencies (e.g., USEPA, US Fish & Wildlife Service, Cal. Dept. Fish & Game, NOAA Fisheries, State and Regional Water Boards) and NGOs (e.g. The Nature Conservancy, National Heritage Institute). Has briefed individual State Water Board members and resource agency staff on nutrient- and food web-related issues in the San Francisco Estuary.

***Scientific Commentary.*** Responsible for analyzing science and policy developments and providing written and oral responses to work products of bodies including administration task forces (such as Gov. Schwarzenegger's Delta Vision Blue Ribbon Task Force, National Academy of Science Review of the Biological Opinions for the SWP/CVP operations), State Water Board (e.g., Bay-Delta Plan), the Central Valley Regional Water Quality Control Board, Interagency Ecological Program (IEP), CALFED, Delta Regional Ecosystem Restoration Implementation Plan, Bay-Delta Conservation Plan (BDCEP), and the Delta Stewardship Council.

***Participation in Delta Venues.***

Ongoing	<b>Member:</b> Interagency Ecological Program (IEP) POD Contaminant Workteam and Ammonia Subcommittee, 2008-present
September 2011	<b>Presenter</b> (poster): 10 <sup>th</sup> Biennial State of the San Francisco Estuary Conference, Oakland, CA, September 20-21, 2011.
January 2011	<b>Invited Panel Member:</b> Delta Stewardship Council Independent Science Board Workshop on Delta Stressors, January 12-13, 2011
December, 2010	<b>Provided Oral Testimony:</b> Central Valley Regional Water Quality Control Board Hearing on Tentative SRCSD NPDES Permit, Dec. 9, 2010
September 2010	<b>Presenter</b> (oral talk): 6th Biennial Bay-Delta Science Conference, Sacramento, CA, Sept. 27-29, 2010
May 2010	<b>Presenter</b> (poster): Interagency Ecological Program (IEP) Annual Workshop, Sacramento, CA, May 25-26, 2010
March 2010	<b>Invited Panel Member</b> (oral and written testimony): Other Stressors: Water Quality Panel, State Water Resources Control Board Informational Proceeding to Develop Flow Criteria for the Delta Ecosystem, Sacramento, CA., March 22-24, 2010
October 2009	<b>Invited Speaker:</b> Interagency Ecological Program (IEP) Workshop #5: Bay-Delta Monitoring Questions & Tools for the 21st Century, Sacramento, CA., October 9, 2009
September 2009	<b>Presenter</b> (poster): 9th Biennial State of the San Francisco Estuary Conference, Oakland, CA, September 29-October 1, 2009
August 2009	<b>Invited Panel Member and Speaker:</b> Central Valley Regional Water Quality Control Board Ammonia Summit, Rancho Cordova, CA., August 18-19, 2009
March 2009	<b>Invited Panel Member:</b> CalFed Ammonia Workshop, Sacramento, CA., March 10-11, 2009

**Ventura River Watershed Algae TMDL Development**

Responsible for technical and strategic assistance for multiple stakeholders related to the ongoing development of the Ventura River Algae TMDL. Primary author of the Algae TMDL Work Plan for the Ventura River watershed, which presented a comprehensive approach for development of a stakeholder-led TMDL for algae and nutrients. Activities carried out on behalf of Ojai Valley Sanitary District include strategic monitoring, detailed analyses of nutrient sources and numeric targets for use by the Los Angeles Regional Water Quality Control Board, assistance at meetings with the Regional Board, and evaluation of allocation and implementation strategies. Was instrumental in the formation of a technical advisory group (TAG) formed in response to the Ventura River Algae TMDL. As LWA project manager for the Ventura River TAG, provides technical and planning assistance to the Ojai Valley Sanitary District, the cities of Ventura and Ojai, Ventura County Watershed Protection District, and the Ventura County Agricultural Irrigated Lands Group. Served as LWA project manager for an investigation of relationships between nutrient concentrations and benthic algal biomass in reference reaches of the Ventura River.

*Diana Engle, Senior Scientist*

**Calleguas Creek Watershed TMDL Implementation**

Designed and conducted a Special Study to evaluate the extent of algal impairment in tributaries of Calleguas Creek and Mugu Lagoon. Field work included quantification of benthic and planktonic algal biomass, and deployment of instrumentation for continuous measurement of dissolved oxygen and pH. Analyses included comparisons of field and laboratory protocols, and examination of relationships between algal biomass and physicochemical parameters. Currently contributing to the development of a Salt & Nutrient Management Plan for Calleguas Creek Watershed and supervising components of implementation of the Calleguas Creek Watershed Salts TMDL including continuous real-time monitoring of salts (using a watershed-wide network of multi-sensor sondes equipped with telemetry) and calculation of watershed salt balances.

**Calleguas Municipal Water District – Surface Flows and Groundwater Recharge**

In support of groundwater management and water supply planning in the Calleguas Creek Watershed, and on behalf of Calleguas Municipal Water District and the Las Posas Water Users Group, conducted a study to delineate the losing and gaining reaches of the Arroyo Las Posas and Arroyo Simi. Field work included gaging of streams in multiple reaches using continuous depth monitors and development of rating curves. Currently designing a follow-up long-term monitoring program.

**Ventura County Irrigated Agricultural Lands Group (VCAILG)**

Designed and currently implementing a two-year Special Study to evaluate occurrence and abundance of bacteria in agricultural runoff in Ventura County. Program includes monitoring of tailwater and tile drainage in row crops, berries, sod farms, nurseries, and orchards at edge-of-field during wet and dry weather. Program includes comparison of edge-of-field bacteria concentrations with those in receiving water, and comparison with Basin Plan objectives.

**Central Valley Clean Water Association (CVCWA)**

Serves as a member of the CVCWA Delta Team. Author of semi-monthly newsletter tracking activities and work products of San Joaquin/Sacramento River Delta-related forums such as Delta Vision, Bay Delta Conservation Plan, Interagency Ecological Program, CALFED, State Water Resources Control Board, Central Valley and San Francisco Bay Regional Water Quality Control Boards, Department of Water Resources, water agencies, universities, USEPA, NMFS, USFWS, state legislature, and the courts.

**RELEVANT EXPERIENCE PRIOR TO LARRY WALKER ASSOCIATES**

Santa Barbara Channelkeeper. As an independent consultant, coauthored an evaluation of existing and potential onshore and offshore sources of water quality impairment affecting the Channel Islands National Marine Sanctuary and the Santa Barbara Channel.

Marine Science Institute, University of California, Santa Barbara. As Research Specialist, carried out comprehensive assessments of the ecological condition and potential impairments of aquatic resources at Channel Islands National Park, CA and Cabrillo National Monument, CA. Marine and freshwater habitats were evaluated with respect to biota, water quality, and consumptive and non-consumptive uses (funded by the U.S. National Park Service).

California Air Resources Board. As Post-doctoral Researcher, synthesized the results of a ten year program assessing the potential impacts of acid deposition on high altitude aquatic ecosystems in California.

U.S. National Park Service and U.S. Geological Survey. As an independent consultant, analyzed and published a 16-year data set on nutrient fluxes in mixed conifer forest and the consequences of prescribed fire on stream hydrology, stream chemistry, and watershed mass balances in Sequoia National Park.

Donald Bren School of Environmental Science & Management, University of California, Santa Barbara. As Analyst, conducted analysis of policy and technology-based solutions to environmental problems, and development of new research initiatives. Agenda included financial instruments for fisheries reform, molecular probes for pathogen detection in coastal water, and markets for ecosystem services on the agricultural landscape. Activities included research plans, financial risk assessment, and stakeholder meetings with industry and agency leaders (funded by the Paul G. Allen Family Foundation).

Planet Earth Science, Santa Barbara, CA. As a consultant, produced interactive CD-ROMs (virtual science expeditions) and on-line courseware for junior high, high school and college students, with strong emphasis on interpretation of satellite data. Foci of digital products were river ecology, global warming, hurricanes, and atmospheric aerosols (funded by the NASA Earth Science Information Partnership).

Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara. As Lecturer, taught the following upper division courses: Tropical Ecology (8 years), Aquatic Community Ecology (3 years), and Undergraduate Ecology Seminar (4 years)

#### **SELECTED PUBLICATIONS AND PRESENTATIONS**

- Engle, D.L. (2012) Memorandum: Phase I Study: Surface Flow and Groundwater Recharge in Arroyo Las Posas. Prepared for Calleguas Municipal Water District, Jan. 15, 2012.
- Engle, D.L. (2011) How well do we understand the reproductive consequences of copepod diet in the San Francisco Estuary? A survey of the direct evidence. 10<sup>th</sup> Biennial State of the San Francisco Estuary Conference, Oakland, CA, September 20-21, 2011.
- Engle, D.L. (2010) How well do we understand the feeding ecology of estuarine mesozooplankton? A survey of the direct evidence. 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010.
- Engle, D. and C. Suverkropp (2010) Memorandum: Comments for Consideration by the State Water Resources Control Board Regarding the Scientific Article *Long-term Changes in Nutrient Loading and Stoichiometry and their Relationships with Changes in the Food Web and Dominant Pelagic Fish Species in the San Francisco Estuary, California* by Patricia Glibert. 17 pp. July 29, 2010.
- Engle, D.L., & G. Lau (2010) Does Ammonia Exceed Toxicity Thresholds in the Upper San Francisco Estuary? A Comparison of Ambient Data and Toxicity Thresholds for 1974-2010. Interagency Ecological Program (IEP) Annual Workshop, Sacramento, CA, May 25-26, 2010.
- Melack J.M., and D.L. Engle (2010) An organic carbon budget for an Amazon floodplain lake. *Verh. Internat. Verein. Limnol.*, in press.

- Engle, D. (2010) Testimony before State Water Resources Control Board Delta Flow Criteria Informational Proceeding. Other Stressors-Water Quality: Ambient Ammonia Concentrations: Direct Toxicity and Indirect Effects on Food Web. Submitted to the State Water Resources Control Board, 40 pp. February 16, 2010.
- McCord, S., J. Walker, and D. Engle (2009) A pilot study using continuous ammonium sensors in the Sacramento River. Interagency Ecological Program (IEP) Workshop #5: Bay-Delta Monitoring Questions & Tools for the 21st Century, Sacramento, CA., October 9, 2009.
- Engle, D.L., and G. Lau (2009) Total and Un-ionized Ammonia Concentrations in the Upper San Francisco Estuary: A Comparison of Ambient Data and Toxicity Thresholds. 9th Biennial State of the San Francisco Estuary Conference, Oakland, CA, September 29-October 1, 2009.
- Engle, D., J. Walker, S. McCord, C. Irvine, and C. Williams (2009) Sacramento River Ammonia Pilot Study Results. Technical Memorandum submitted to the Interagency Ecological Program (IEP) Pelagic Organism Decline (POD)–Contaminants Work Team, August 13, 2009.
- Engle, D. (2009) Total Ammonia and Un-Ionized Ammonia Concentrations in the Delta. An Examination of Ambient Concentrations and Toxicity Thresholds. Central Valley Regional Water Quality Control Board Ammonia Summit, Sacramento, California, August 18-19, 2009.
- Altstatt, J., D.L. Engle, and K. Redmond (2009) Water quality characterization of the Channel Islands National Marine Sanctuary and Surrounding Waters. Submitted to National Oceanic and Atmospheric Administration, Channel Islands National Marine Sanctuary, May 2009. 229 pp.
- Larry Walker Associates (2009) Source Assessment Report: Nitrogen and Phosphorus in the Ventura River Watershed. Prepared for Ojai Valley Sanitary District, July 9, 2009. 55 pp. (author)
- Larry Walker Associates (2008) Calleguas Creek Nitrogen Compounds and Related Effects TMDL. Results of Special Study on Type and Extent of Algae Impairments. Prepared for the Calleguas Creek Watershed Management Plan, July 16, 2009. 93 pp (author).
- Engle D.L., J.M. Melack, R.D. Doyle and T.R. Fisher (2008) High rates of net primary production and turnover of floating grasses on the Amazon floodplain: Implications for aquatic respiration and regional CO<sub>2</sub> flux. *Global Change Biology*, 14 (2): 369-381. doi: 10.1111/j.1365-2486.2007.01481.x.
- Engle D.L., J. Sickman, C. Moore, A. Esperanza, J. Melack and J. Keeley (2008) The biogeochemical legacy of prescribed fire in a giant sequoia-mixed conifer forest of Sequoia National Park: A 16-year record of watershed balances. *Journal of Geophysical Research-Biogeosciences*, 113, G01014. doi:10.1029/2006JG000391
- Melack J.M. & Engle D.L. (2007) Carbon dynamics in Amazon floodplain lakes, 30th Congress of the International Association of Theoretical and Applied Limnology, August 2007, Montreal, Quebec.
- Engle D.L. (2006) Assessment of Coastal Water Resources and Watershed Conditions at Channel Islands National Park, California. Tech. Report NPS/NRWRD/NRTR-2006/354. 337 pp.  
[http://www.nature.nps.gov/water/watershed\\_reports/WSCondRpts.cfm](http://www.nature.nps.gov/water/watershed_reports/WSCondRpts.cfm)

- Engle D.L. and J.L. Largier (2006) Assessment of Coastal Water Resources and Watershed Conditions at Cabrillo National Monument, California. Tech. Report NPS/NRWRD/NRTR-2006/355. 235 pp.  
[http://www.nature.nps.gov/water/watershed\\_reports/WSCondRpts.cfm](http://www.nature.nps.gov/water/watershed_reports/WSCondRpts.cfm)
- Engle D.L. (2005) Pathogen Free Water - Molecular Probes for Safe Coastal Water, A Project Plan for the Global Solutions Institute, 65 pp.
- Engle D.L. (2002) Comparative analysis of high resolution remote sensing satellite systems: Landsat7, SPOT, IKONOS, ASTER, and RADARSAT. Prepared for the Japan External Trade Organization.
- Engle D.L. and J.M. Melack (2001) Ecological consequences of infrequent events in high-elevation lakes and streams of the Sierra Nevada, California. *Verh. Internat. Verein. Limnol.* 27: 3761-3765.
- Caron B., Gautier C., Landsfeld M. & Engle D. (2001) Earth Data Multimedia Instrument – EDMI: A NASA-funded showcase that brings research technology to secondary education. American Geophysical Union, December 2001, San Francisco, CA.
- Engle D. and J.M. Melack (2000) Methane emissions from an Amazon floodplain lake: Enhanced release during episodic mixing and during falling water. *Biogeochemistry* 51: 71-90.
- Engle D.L. and J.M. Melack (1997) Assessing the potential impact of acid deposition on high altitude aquatic ecosystems in California: Integrating ten years of investigation. Final Report. Prepared for the California Air Resources Board. Contract A093-312. [www.arb.ca.gov/research/abstracts/93-312.htm](http://www.arb.ca.gov/research/abstracts/93-312.htm).
- Engle D.L. and J.M. Melack (1995) Zooplankton of high elevation lakes of the Sierra Nevada, California- Potential effects of chronic and episodic acidification. *Arch. Hydrobiol.* 133: 1-21.
- Engle D.L. (1993) Effects of suspended sediments on nutrient availability, algal growth and aquatic invertebrates of the Amazon floodplain. American Society of Limnology & Oceanography, Aquatic Sciences Meeting, June 1993, Edmonton, Alberta.
- Engle D.L. and J.M. Melack (1993) Consequences of riverine flooding for the seston and periphyton of floating meadows in an Amazon floodplain lake. *Limnology & Oceanography* 38: 1500-1520.
- Melack J.M., J.O. Sickman, F.V. Setaro and D. Engle (1993) Long-term studies of lakes and watersheds in the Sierra Nevada, patterns and processes of surface-water acidification. Final Report. Prepared for the California Air Resources Board. Contract A932-060.
- Engle D.L. (1992) Inundation of an Amazon floodplain lake during an unusually high flood year: consequences for seston and the periphyton of floating meadows. American Society of Limnology & Oceanography, Aquatic Sciences Meeting, February 1992, Santa Fe, NM.
- Melack J.M. & Engle D.L. (1991) Methane emissions from the Amazon floodplain: enhanced release during episodic mixing of lakes and a habitat-based regional assessment. 10th International Symposium on Environmental Biogeochemistry, August 1991, San Francisco, CA.
- Engle D.L. and O. Sarnelle (1990) Algal use of sedimentary phosphorus from an Amazon floodplain lake: Implications for total phosphorus analysis in turbid waters. *Limnology & Oceanography* 35: 483-490.

*Diana Engle, Senior Scientist*

- Engle D.L. and J.M. Melack (1990) Floating meadow epiphyton: Biological and chemical features of epiphytic material in an Amazon floodplain lake. *Freshwater Biology* 23: 479-494.
- Fisher T.R., Doyle R.D., Moline M.A. & Engle D.L. (1989) Ecology of periphyton on the Amazon Floodplain. Symp. Floodplain Rivers, Baton Rouge, LO.
- Engle D.L. & Melack J.M. (1988) Epiphyton of floating meadows. 2nd Brazilian Conference of Limnology, July 1988, Cuiba, Mato Grosso, Brazil.
- Engle D.L. (1985) Haemoglobin production by *Daphnia pulex*; Intraspecific variation and its relation to habitat. *Freshwater Biology* 15: 631-638.